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British Coal Utilization Research Association Monthly Bulletin and Quarterly Gazette
Business Week
Butane-Propane News
California Oil World
Canadian Chemical Processing
Canadian Gas Journal
Canadian Journal of Chemical Engineering
Canadian Journal of Chemistry
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Catalysis, Journal of
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Chemical and Engineering Data, Journal of
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Chemical & Process Engineering
Chemical Documentation, Journal of
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Chemical Physics, Journal of
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Chemical Society, Journal of (British)
Chemical Society, Proceedings (British)
Chemical Week
Chemistry & Industry (British)
Chromatography, Journal of (Netherlands)
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Coal Utilization
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Combustion & Flame (British)
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Corrosion Technology (British)
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Electrochemical Society, Journal of
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Institute of Fuel, Journal of (British)
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Petroleum (British)
Petroleum Engineer, The (Drilling and Producing)
Petroleum Management
Petroleum Refiner
Petroleum Technology Journal of
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Physical Chemistry, Journal of
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Physics of Fluids (British)
Pipeline Engineer
Pipe Line Industry
Pipeline News
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